POS526 2nd Weekly Report

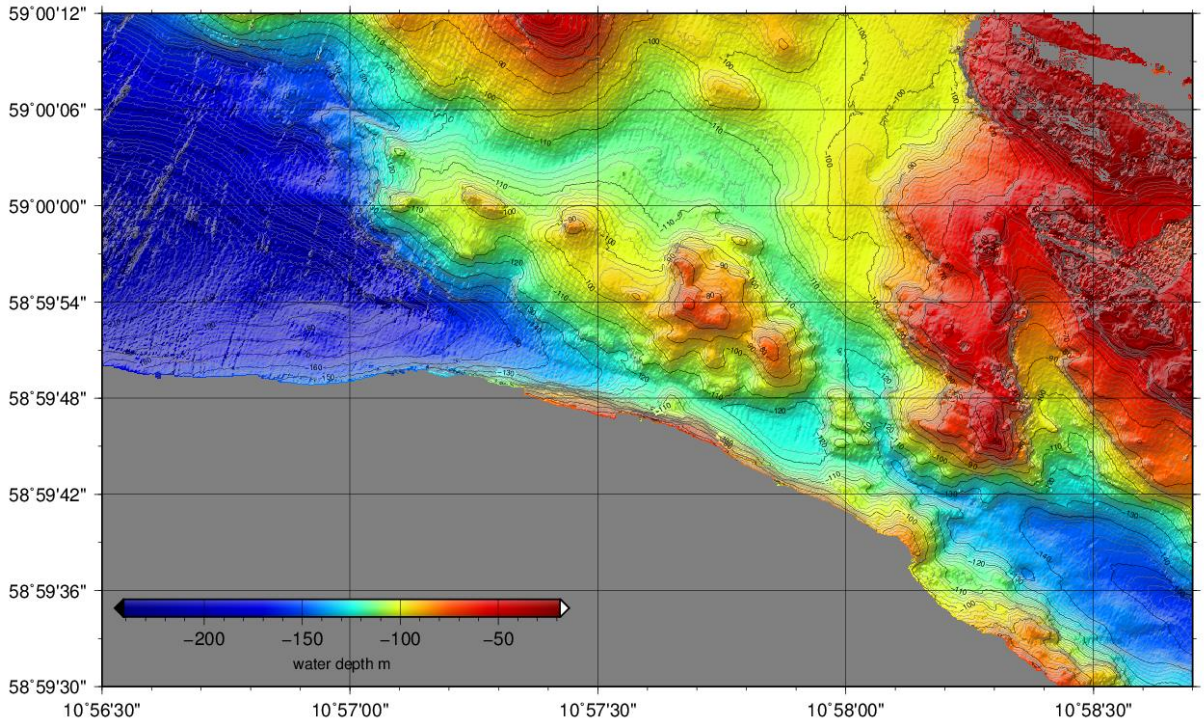
Monday 6th August 2018, 09:37 local time, 59°00.22'N 10°58.91'E

As anticipated we arrived in Hirtshals 'bang on time' at 15:00 in the harbour, where four of our colleagues from GEOMAR and AWI were already waiting at the pier for us. Kevin., Yifan, Jochen and Autun had started in Kiel at 8:00am, making their way to north Denmark, while POSEIDON was still steaming in good weather conditions. In the harbour there was a quick hand over from the departing scientists to the new arrivals; in contrast to other cruises, the hand over was focused on data management, informing the new arrivals on recent computer updates, and 'did you do the camera calibration already?' questions from the arriving participants, than taking care of samples, chemicals and determining the next sample locations – more common concerns during such exchanges of personnel. The exchange process was smooth, and the six people leaving the ship could start their 5h journey south shortly before 5pm. As we heard during the evening, they arrived safely in Kiel with everybod dropped off at their final destination.

Ahead of us was a contrasting scientific topic, a different 'much more rugged' undersea and oversea landscape, and new technical challenges. Before leaving harbour, everybody stretched their legs in Hirtshals and/or get accustomed with the ship (two colleagues joined POSEIDON for their first participation in a scientific cruise – always an exciting stage in a marine research career). We left Hirtshals at 8:00 in the morning of the 2nd August and arrived in the working area of the Tisler Reef at 18:00, immediately carrying out a CTD fpr collecting good sound velocity profiles followed by two TV-CTD tows across the reef. These were conducted to determine the state of the corals on top of the central reef peak, and to identify a good location for the following ANTON and JAGO dives. With regards to the multibeam, apparently at present there is only one multibeam data set that has been collected from the reef, and has been available for use in many publications from this area. This was recorded during cruise ALKOR 232 in 2003, carried out by one of the POS526 scientists, a much younger 'now chief-scientist'. The multibeam on POSEIDON is a modern Seabeam 3050; the previous version mounted on the ship was also a Seabeam but an older 1180 system. The new device has more beams, a smaller beam width and thus is capable of acquiring a better resolution of data than the older model, which became evident when comparing the old and new data collected during the current cruise.

The weather was very good the 3rd August and the first JAGO and AUV dives were successfully undertaken, ANTON tested its multibeam and JAGO aimed at deploying a number of small self-contained camera systems from AWI just constructed before the cruise. Unfortunately the systems didn't work optimally during their first deployment, which gave Autun some extra long hours to fix them. The next day also brought good weather, with two JAGO dives before and after lunch, as well as an AUV dive from 12:00 to 14:00. The first JAGO dive was aimed at performing photogrammetric measurements with a stereographic camera system, this worked successfully. The JAGO second dive was an exploratory dive commencing at the deep gully east of the main reef complex. Here Jürgen and Jens experienced some very strong currents that were good for giving first hand insight how

plankton might feel from time to time. Despite this they discovered a very healthy and thriving reef system that stretches from the gully upward to the next rugged mount structure in 120 to 105m water depth. This dive finally ended at the peak of the main reef complex in 68m water depth, with the dive track covering the whole length of the most healthy section of living reef. From our work it is clear that the eastern side of the reef is much more vigorous in coral growth than the central peaks and we start to think that the upper part may be much less pristine not due to fishing activity but because of prevalent environmental conditions. We believe this to be a possibility as the water structure is strongly stratified, with a very strong density change at depths of between 20 and 40m, which also gave JAGO some trouble during one dive. The neutrally buoyant submarine was not heavy enough to sink to the bottom of the sea, even with the thrusters employed – to solve this problem weight was needed, and was placed on top to make it finally sink. We think that this strong stratification prevents the deeper parts of the reef from experiencing warm water episodes, exposing these lower regions to less temperature stress, whilst simultaneously delivering an elevated supply of food to these deeper corals by the strong bottom currents we observed (and felt in the submarine) through the gully, with more than 1 kn speed.

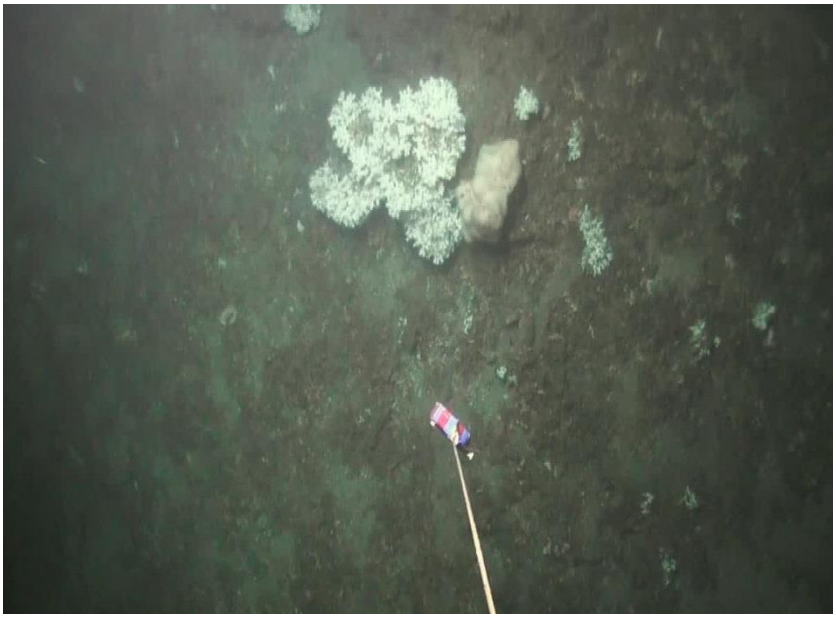


The new Tisler Reef map, the data are almost un-edited, thus strong artefacts occur in the NE corner.

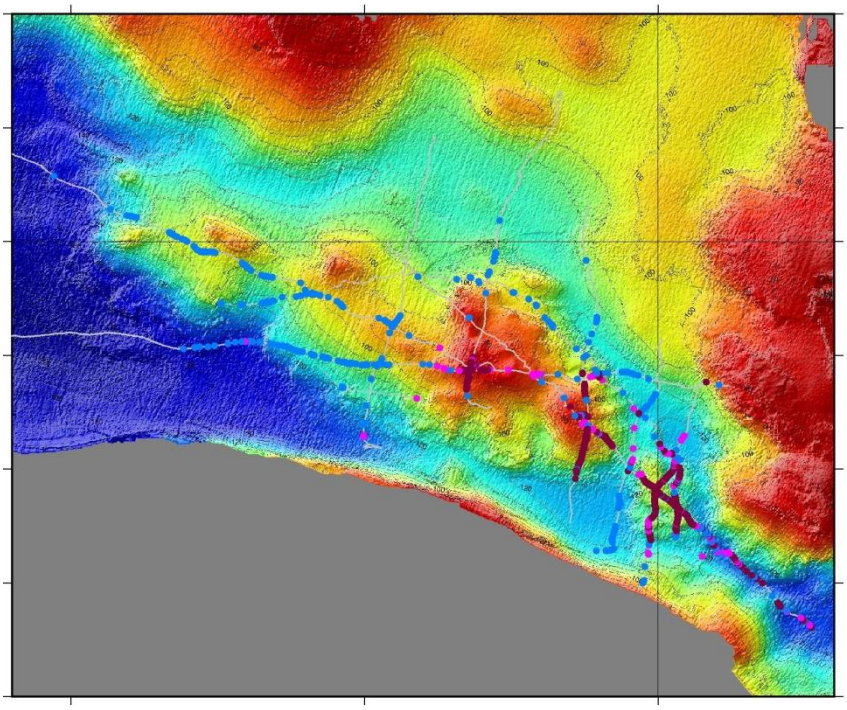
After this exciting new finding, the night was spent conducting ADCP measurements, to verify the local current regime at different locations of the reef. This was followed by a series of five North-South video CTD transects, each of which crossed the main reef at different locations, each investigating different smaller reef summit mounds. This night of seafloor video filming ended just before breakfast, with JAGO and AUV dives planned for the following day. Unfortunately the wind picked up and waves reached a height which

rendered the safe deployment and/or operation of JAGO or ANTON impossible. The AUV has some problems in wavy conditions with communication to the ship, as it is equipped with a short WIFI antenna which loses connection when waves submerge it. This is one of several issues that need to be solved in the coming months, to better optimise this useful device for future research. We used the poor weather conditions to continue our improved mapping of the seafloor, and we extended the bathymetric map towards the NW. Following this mapping, we started another TV-CTD covering the entire length of the reef in E-W direction, first running on the northerly side of the reef before bisecting it and finishing the video transect on the southern flank of the reef. The southern region was marked by the 'sudden' appearance before the TV-CTD of a steep bedrock wall, and to avoid this we winched the CTD higher into the water column then returned the CTD to deck.

The wind had been reducing in strength for several hours during the TV-CTD work, and because of this the last two days have been ideal for JAGO and AUV dives. The morning of 6th August was thus used for a rendezvous dive between JAGO and ANTON. ANTONs dive mission was planned in such way that the robot would stay in 20m water depth for a period of time before diving to the sea bottom, where he was programmed to wait for 20 minutes to allow JAGO to dive to the seafloor and find him. Exact navigation was needed for this combined dive, and luckily some problems and technical challenges associated with the USBL had been solved the night before, and we could see both vehicles clearly, well distinguishable from each other, on our underwater navigation screens. Possibly the most excited cruise participant was Jürgen, who piloted the JAGO to acquire underwater footage of the AUV in action. The flashing of the AUV beacon light helped the JAGO team see it in the distance. This spotting of the AUV was made even easier by programming ANTON to switch on his camera and lighting systems, illuminating the seafloor 1.7m below the AUV.



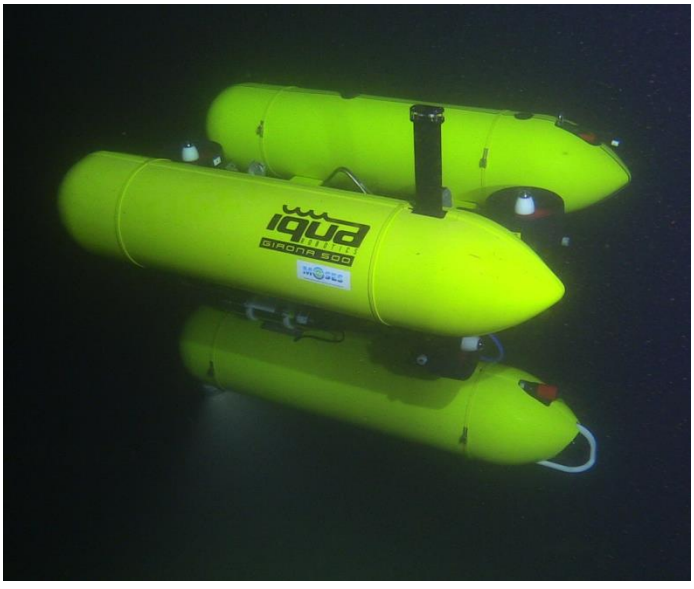
Frame grab of the TV-CTD video footage filming a living coral, a sponge and coral rubble in about 103m water depth.



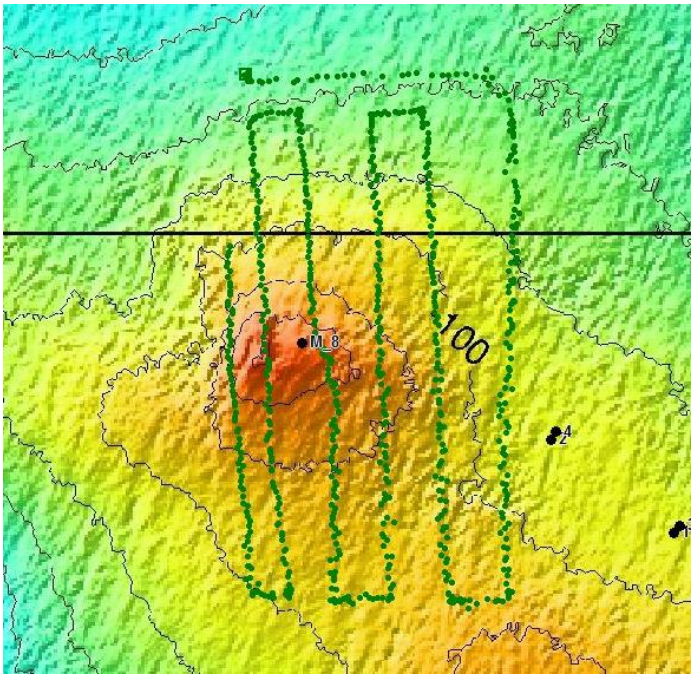
The high number of TV-CTD tows will allow a very detailed habitat mapping of the Tisler reef; something that has not been done so far. Shown are the tracks and the occurrence of corals (red) and sponges (blue)

Everybody was very happy that finally, after all the efforts to get the USBL working properly, we acquired excellent navigation for both systems simultaneously. This allowed the JAGO position to be sent directly to JAGO from the ship, to be displayed within the submersible within the OFOP software. This was thoroughly tested on JAGOs 1400th dive, during which Karin and Jürgen started a new era of JAGO diving, with accurate positioning in real-time available within JAGO.

The night was again used to fill in gaps in the bathymetric map. Although normally not a great problem, the steep flanks and the very very hard ground (real bedrock) caused the system to fail and register the accurate seafloor on only one swath side, but the 1st multiple on the other. However the map is growing and data are currently being processed to generate a grid with 1m by 1m cell size.

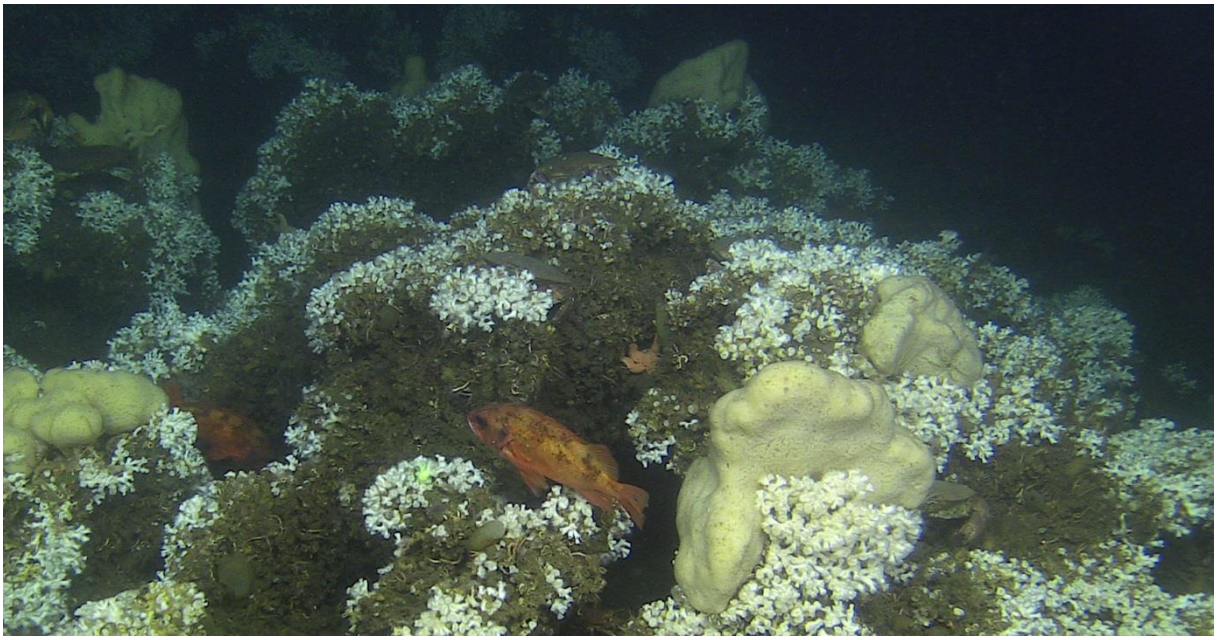


Little ANTON illuminating the water with its (not bright enough) camera lights. The AUV cannot be seen as a toddler anymore as during the first half of the cruise, everybody involved got some confidence in handling and working with the AUV. Nevertheless, it will take much more efforts to make it a similar work-horse as his big sister TIFFY.



Exact navigation of a AUV multibeam dive over a 10m high mound in 100m water depth, the shown green dots are raw USBL positions, the spacing between the lines was planned to be 17m, based on the USBL it varies between 16m and 23m, in our opinion, not too bad a result.

To summarise, the first week at Tisler was very successful and we are confident that the last two days will bring again new insights into technical challenges, as well as additional scientific data for the better understanding of the spatial distribution of habitats and fauna assemblages across the various reef and non-reef environments in our work area.



Corals seen from JAGO.

Many greetings from Norway send the scientists and technicians on board RV POSEIDON POS526!